

Commander, Operational Test and Evaluation Force



Modeling and Simulation Lessons Learned for Tactical TOMAHAWK OPEVAL

14 September, 2004



Overview

- **Background**
- **Areas of Contention**
- **Lessons Learned**
- **DD-X M&S Team Observations**



Background

- **The Tactical TOMAHAWK Weapon System (TTWS) is a complex system of systems that recently completed operational evaluation**
 - **Consists of three major segments: the Tactical TOMAHAWK Weapon Control System (TTWCS), the Block III or IV TOMAHAWK missile, and the TOMAHAWK Command and Control System (TC2S)**
 - **Modeling and Simulation played a significant role**
 - **VV&A was completed for 5 distinct simulations for OPEVAL**



Background (cont)

- **(2) 6-DOF software models of the Block IV missile were used to evaluate TOMAHAWK missions**
- **(1) 6-DOF HWIL model of the Block IV missile was used to evaluate missile performance in a variety of contexts**
- **The HWIL model was integrated into the tactical system in a laboratory, which was then accredited to evaluate end-to-end system performance**
- **A stimulator was accredited to represent the communications of a large salvo of TOMAHAWK missiles in flight, called the Missile Comms Simulator (MCS)**
 - **For Battlegroup Scenario testing**



Areas of Contention

- **Most of the simulations were straightforward missile models and agreed to early in development, but there was significant disagreement between COTF and PMs on the need for the MCS**
 - **PM felt that existing single-missile simulations could be used to meet the OPEVAL requirement**
 - **After considerable time delay, TEGC was convened, ASN/RDA came down on the side of COTF**
 - **Program sponsor was required to identify ~2M to develop the simulator**
 - **VV&A for the MCS was completed just in time for the OPEVAL event**



Areas of Contention (cont)

- **Developer for the HWIL simulation presented intentions to complete V&V by comparison to first two developmental test flights**
 - **COTF objected because the first two flights were launched from non-representative platforms, and several subsequent test flights had been executed from ships and submarines**
 - **COTF sent letter of concern to Program Manager**
 - **PM agreed to include more recent test flights in V&V for HWIL simulation**
 - **VV&A for the simulation was not completed until after the OT event**
- **No VV&A packages were delivered within COTF specified time frames**



Lessons Learned

- **Things we (COTF) did well**
 - **Fully engaged in the VV&A process from the beginning**
 - **Attended all Simulation Control Panels (SCP); active participation**
 - **Helped maintain focus at SCPs on how simulations would be used during OPEVAL**
 - **Identified issues of contention as soon as they were recognized**
 - **Very flexible in working with PM issues that caused late VV&A package delivery**



Lessons Learned (cont)

- **Areas needing improvement**
 - **Learning curve on new system capabilities and how M&S would be used/configured**
 - **Resulted that it took longer than necessary for contention to percolate to PM decision makers**
 - **Clear and consistent communication to PM of the COTF expectations for types of M&S required and VV&A package content**
 - **Resulted that documentation required rework after received by COTF, in spite of COTF participation on SCPs**
 - **Personnel should be identified with system level operational and technical knowledge, and provided with M&S training**
 - **This combination is most efficient for successful M&S integration**



Lessons Learned (cont)

- **Observations at SCPs**
 - **Tail wagging the dog: easy to lose focus on what a particular model is being accredited to do, VV&A becomes a “check in the box”**
 - **Lack of M&S user representation on SCPs**
 - **Contributes to loss of focus**
 - **Unclear definition of what requires VV&A, and what does not**
 - **Ideally everything that is not a real platform in combat is M&S and requires VV&A, but this definition is not useful given fiscal realities**
 - **Covering same ground in SCPs; difficult to standardize due to uniqueness of each M&S**
 - **Approach VV&A for unique models; attempt to apply same paradigm for a stimulation device as for high-fidelity**



DD-X Early Observations

- **DD-X is in early stages of development. OTD has attended two M&S “Cross Product Team” (CPT) meetings**
- **DD-X CPT M&S Member Observations**
 - **analysts switched models in uncontrolled manner**
 - **V&V plans, reports and briefings late or not provided**
 - **analysis team widely dispersed challenging coordination**
 - **compressed schedule**
 - **Lack of authority for accreditation.**
 - **Need buy-in from folks who own the resources. It’s all about the money that resource managers are willing to spend their money on. Unless the ARP chair is the owner of the hours that the MSPs are spending**



Lessons Learned (cont)

- **DD-X M&S Cross Product Team Member Observations (cont)**
 - **Convincing so many entities that they need to make VV&A a priority is challenging**
 - **Uncertainty in development direction among the various segments ripples through the program, including M&S VV&A**
 - **VV&A will be secondary to other considerations, such as completion of actual testing in time for milestone decisions**
 - **understaffing for M&S VV&A accomplishment**
 - **realignment of system analysis scope**
 - **DD-X unique startup challenge, immature processes, blank slate**



Lessons Learned (cont)

- **DD-X M&S Cross Product Team Member Observations (cont)**
 - **M&S users over reliant on VV&A champion**
 - **VV&A process disconnected from M&S planning usage/development processes.**
 - **Perception that VV&A process is too complex**
 - **Perception that formal VV&A does not add value.**
 - **Late selection of M&S and incomplete accreditations**
 - **Assessments require “large crowds of people”; i.e., significant dedication or resources.**



Questions

